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EXAMINER	
DHINGRA, RAKESH KUMAR	
ART UNIT	PAPER NUMBER
1763	

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Please find below and/or attached an Office communication concerning this application or proceeding.

C

Office Action Summary	Application No.	Applicant(s)	
	10/716,729	BRCKA, JOZEF	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/6/06 has been entered.

Specification

The disclosure is objected to because of the following informalities:

Paragraph 0055, line 13 – "shield 54" may be replaced with "shield 53" as shown in Figure 7.

Appropriate correction is required.

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended independent claim 1 and dependent claim 4 by adding new limitations.

Reference by Usai when combined with Tanaka et al reads on amended claim 1 limitations including the now added limitation interalia "peripheral ionization source connected to and surrounding the substrate support", since per Usai (Figure 4) antenna coil 2 is "connected" to substrate support electrode 3 (Claim does not recite that it is "mounted on substrate support"). Accordingly claim 1 and dependent claims 2, 3 and 5-17 have been rejected under 35 USC103 (a) as explained below.

As regards amended claim 4, new reference has been found (Roderick -US Patent No. 6,353,206) that when combined with Usai and Tanaka et al reads on claim limitation "antenna is capacitively coupled

in series with the substrate support". Accordingly claim 4 has been rejected under 35 USC 103 (a) as explained below.

Further claims 18-20 have also been rejected under 35 USC 103 (a) as explained below.

As regards double patenting rejection, applicant's suggestion that any double patenting issues with application number 10/717,268 be dealt with as the prosecution of that application proceeds further, has been noted. However for the present the double patenting rejection is maintained with reference to the updated list of claims (dt. 10/27/06) in the co-pending application # 10/717,268.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539).

Regarding Claims 1, 8: Usai teaches a plasma apparatus (Figures 1-4) that comprises an RF generator 6,

a series RF circuit that includes a substrate support electrode 3 and an inductive plasma coil (peripheral ionization source) 2, {that is, peripheral ionization source and the substrate support are connected together) a matching circuit 5 coupled to the series circuit such that both capacitive and inductive plasma are generated within the vacuum chamber. Usai also teaches that the apparatus generates a stable high density plasma (Column 3, line 30 to Column 4, line 15).

Usai teaches peripheral ionization source and substrate support as connected but does not teach peripheral ionization source surrounding the substrate support on the periphery of the substrate support,

the substrate support and the peripheral ionization source forming a common planar surface having a substrate support surface at its center.

Tanaka et al teach a plasma apparatus (Figures 1, 3) that includes a plasma chamber 1 with pedestal 6 that has a substrate support portion 7 on which a substrate 8 is supported. Tanaka et al further teach that the apparatus further includes a coil (peripheral ionization source) 20 for generating plasma in the chamber that surrounds and is mounted on the periphery of the substrate support 6. Tanaka et al also teach that coil 20 is movable in up/down direction with the help of piston cylinder assembly 30 (to obtain optimum plasma field pattern) over a range from below the plane of substrate support to a plane above that of the substrate support 6 (that is, the peripheral ionization source surrounds the substrate support on the periphery of the substrate support, and the substrate support and the peripheral ionization source form a common planar surface having a substrate support surface at its center (column 3, line 15 to column 4, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coil that surrounds the substrate support and forms a common planar surface with the substrate support (by up/down movement of coil) as taught by Tanaka et al in the apparatus of Usai by changing the location of the coil to provide uniform plasma potential and density parallel to surface of substrate (column 2, lines 20-40).

Regarding Claim 3: Tanaka et al teach that annular coil 20 surrounds the substrate 8 and its position with respect to substrate support can be adjusted by up/down actuation mechanism (Column 4, lines 5-10).

Claims 2, 5, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Moslehi et al (US patent No. 6,471,830).

Regarding Claim 2: Usai in view of Tanaka et al teach all limitations of the claim including that peripheral ionization source includes coil 2 (Usai) but do not teach a slotted Faraday shield between the inductive element and the plasma for facilitating the

inductive coupling of energy from the inductive element into the plasma and for impeding the capacitive coupling of energy from the inductive element to the plasma.

Moslehi et al teach an inductive plasma apparatus (Figures 4, 6) for a semiconductor wafer processing comprising an RF generator 126, a matching network 128, a substrate support (chuck) 140 and an ionization source (coil segment) 116 that couples to the substrate support. Moslehi et al also teach that the apparatus includes a metallic shield 152 (Faraday) with slots 500 (Figures 10A, 10B) [Column 6, line 65 to column 10, line 8].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a shield with slots as taught by Moslehi et al in the apparatus of Usai in view of Tanaka et al to protect the coil from process plasma and for plasma density enhancement (column 8, lines 10-50).

Regarding Claim 5: Moslehi et al teach all limitations of the claim including that matching network 128 (Moslehi et al – Figures 8A, 8B) is connected to an output of RF generator 126 and the peripheral ionization source (Coil) 116 is capacitively connected at one end thereof to the matching network (through capacitor 160) and is capacitively-coupled to the substrate support surface 140 (Moslehi – Column 9, line 55 to Column 10, line 65).

Regarding Claim 9: Moslehi et al teach that the peripheral ionization source (coil) 116 is capacitively-coupled (inherently) to the substrate support surface 140; and

the matching network 128 has impedances (variable capacitors) 160 in series with the peripheral ionization source (coil) 116 that are appropriately tuned to the frequency of the RF generator 126 (Column 10,lines 45-65).

Regarding Claim 10: Moslehi et al teach that coil 116 is configured to inductively couple RF energy into plasma and it forms a high density plasma that can be configured as required by adjustable

height of the coil 116 with respect to substrate 138 and by using desired shape of the coil (Column 7, lines 15-50 and Column 10, lines 1-7).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Roderick (US Patent No. 6,353,206).

Regarding Claim 4: Usai in view of Tanaka et al teach all limitations of the claim including that peripheral ionization source includes an antenna that surrounds the substrate support and is coupled in series with substrate support.

Usai in view of Tanaka et al do not teach that antenna is capacitively coupled in the RF series circuit.

Roderick teach an apparatus (Figures 4C, 4D) wherein an antenna 40 surrounds the substrate holder 30 and is capacitively coupled (through capacitor C1) in a series circuit to a RF source 31 and through another capacitor C2 to the ground to control resonance frequency and also to minimize arcing between high voltage end of antenna and ground (column 4, line 10 to column 5, line 45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to capacitively couple the antenna with substrate support in the series circuit as taught by Roderick in the apparatus of Usai in view of Tanaka et al to eliminate arcing between high voltage end of antenna and ground.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Moslehi et al (US Patent No. 6,471, 830) and Denda et al (US Patent No. 6,440,260).

Regarding Claim 6: Usai in view of Tanaka et al teach all limitations of the claim except that antenna 116 is capacitively coupled to substrate support surface and is capacitively coupled to chamber ground, and that matching network is capacitively coupled to substrate support surface.

Moslehi et al teach that coil 116 is capacitively coupled to substrate support and is capacitively coupled to chamber ground through capacitor 162 (Figure 8A – Moslehi et al).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the antenna capacitively coupled to substrate support surface and to enable proper matching of grounding and coupling capacitance and minimize RF potential on the antenna.

Usai in view of Tanaka et al and Moslehi et al do not teach match network is capacitively coupled to substrate support surface.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Usai in view of Tanaka et al and Moslehi et al to smooth the power applied to the substrate support.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Dible et al (US Patent No. 6,042,686).

Regarding Claim 7: Usai in view of Tanaka et al teach all limitations of the claim except that the substrate support is an electrostatic chuck.

Dible et al teach an apparatus (Figure 1(a) that includes a substrate support 2 with electrostatic clamping system and connected to RF power source 16 through a capacitor Cd (Column 4, line 45 to Column 5, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use an electrostatic chuck to support the substrate support as taught by Dible et al in the apparatus of Usai in view of Tanaka et al to enable proper wafer clamping and uniform processing from center to edge of wafer (Column 5, lines 5-12).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Denda et al (US Patent No. 6,440,260) and Liu et al (US PG Pub. No. 2002/0027205).

Regarding Claim 11: Usai in view of Tanaka et al teach all limitations of the claim as explained above except that matching network has an input end and an output end and that it comprises of inductor and that the matching network includes an inductor connected in series with the (coil) ionization source.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Usai in view of Tanaka et al to smooth the power applied to the substrate support.

Usai in view of Tanaka et al and Denda et al do not teach that the matching network includes an inductor connected in series and connected to the (coil) ionization source in series.

Liu et al teach an apparatus (Figure 7) that includes a matching network 50 that has an inductor 125 connected in series between input and output ends and the inductor 125 is connected in series with antenna (coils) 46 [Paragraph 0014].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use matching network with inductor connected in series and also connected to ionization source in series as taught by Liu et al in the apparatus of Usai in view of Tanaka et al and Denda et al to minimize reflective power and provide proper coupling current to the coil.

Claims 12, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Denda et al (US Patent No. 6,440,260 and Pu et al (US Patent No. 6,825,618).

Regarding Claim 12: Usai in view of Tanaka et al teach all limitations of the claim

except the matching network is capacitively-coupled to the substrate support surface, the matching network has an input and an output and includes an inductor connected in series between the input and output, and the peripheral ionization source is connected in parallel with the inductor of the matching network.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Usai in view of Tanaka et al to smooth the power applied to the substrate support.

Usai in view of Tanaka et al and Denda et al do not teach that the matching network includes an inductor connected in series and the (coil) ionization source is connected in parallel with the inductor of the matching circuit.

Pu et al teach an apparatus (Figure 8) that includes a matching network 31 that has an inductor 93 connected in series between input and output ends and also includes coils 40, 42 (peripheral ionization source) connected in parallel with the inductor 93 [Column 12, lines 25-45].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use matching network with inductor that is connected to ionization source in parallel as taught by Pu et al in the apparatus of Usai in view of Tanaka et al and Denda et al to minimize capacitive coupling between coil (ionization source) and plasma (column 12, lines 47-55).

Regarding Claim 15: Pu et al teach (Figures 1-3, 9) an ionization source (coil) configuration that has alternating coil segments 40, 42 arranged in a ring (like segmented configuration) positioned to couple power in an annular alternating low and high power distribution. Pu et al also teach that these coils can also be mounted inside the chamber (Figure 9, Column 13, lines 10-25 and Column 2, lines 45-50).

Regarding Claim 16: Pu et al teach that a Faraday shield can be mounted between induction coil array and chamber interior to reduce capacitive coupling (Pu et al – Column 12, lines 59-63). Further, Moslehi et al teach that apparatus also includes shield 153 (in a ring shape) that is a slotted shield (like segmented configuration). Moslehi et al also teach that shape and dimensions of the shield 153 and slots 500 can be optimized to maximize magnetic field penetration from the coil segment 116 through shield 153 for ionization of process plasma (that is coupling of power through alternating high and low transparency sections in the alternating high and low power distribution (Moslehi et al – Column 12, lines 5-25).

Regarding Claims 17-20: Pu et al teach all limitations of the claim including that the ionization source is an antenna and it is possible for antenna/coil to have segments (segmented configuration) in various configurations/shapes (including parallel to dielectric chamber wall 10) as required for process

limitations like shape and uniformity of magnetic field and shape and size of plasma chamber (Pu et al – Column 7, line 30 to Column 8, line 45 and Figure 9, Column 13, lines 10-25 and Column 16, lines 5-20). Further Moslehi et al also teach that shape and dimensions of shield and its slots can be optimized to match with the antenna configuration to minimize sputtering on the shield (Moslehi et al – Column 7 line 15 to Column 8, line 12 and Column 12, lines 25-45 and Column 13, line 34 to Column 14, line 40 and Column 17, line 30 to Column 18, line 20.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Denda et al (US Patent No. 6,440,260) and Hanawa (US Patent No. 6.027,601).

Regarding Claim 13: Usai in view of Tanaka et al teach all limitations of the claim except that matching network is capacitively coupled to substrate support surface and that peripheral ionization source (coil) is connected in the matching circuit in lieu of a separate inductor.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Usai in view of Tanaka et al to smooth the power applied to the substrate support.

Usai in view of Tanaka et al and Denda et al do not teach that peripheral ionization source (coil) is connected in the matching circuit in lieu of a separate inductor.

Hanawa teach an inductive plasma apparatus (Figures 1, 4) that includes a coil antenna 24 that provides matching between RF source 26 and the chamber (column 2, line 65 to column 3, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a peripheral ionization source instead of separate inductor for matching as taught by Hanawa in the apparatus of Usai in view of Tanaka et al and Denda et al to exploit the antenna itself for matching and avoid the matching circuit elements.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) as applied to claim 1 and further in view of Denda et al (US Patent No. 6,440,260), Hanawa (US Patent No. 6.027,601) and Moslehi et al (US Patent No. 6,471,830).

Regarding Claim 14: Usai in view of Tanaka et al teach all limitations of the claim except that matching network is capacitively coupled to substrate support surface and that peripheral ionization source (coil) is connected in series in the matching circuit in lieu of a separate inductor and peripheral ionization source includes individual inductive elements connected in series through stray mutual capacitance.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Usai in view of Tanaka et al to smooth the power applied to the substrate support.

Usai in view of Tanaka et al and Denda et al do not teach that peripheral ionization source (coil) is connected in the matching circuit in lieu of a separate inductor and that peripheral ionization source includes individual inductive elements connected in series through stray mutual capacitance.

Hanawa teach an inductive plasma apparatus (Figures 1, 4) that includes a coil antenna 24 that provides matching between RF source 26 and the chamber (column 2, line 65 to column 3, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a peripheral ionization source instead of separate inductor for matching as taught by Hanawa in the apparatus of Usai in view of Tanaka et al and Denda et al to exploit the antenna itself for matching and avoid the matching circuit elements.

Usai in view of Tanaka et al, Denda et al and Hanawa do not teach that peripheral ionization source includes individual inductive elements connected in series through stray mutual capacitance.

Moslehi et al teach an inductive plasma apparatus (Figures 4, 6) for a semiconductor wafer processing comprising an RF generator 126, a matching network 128, a substrate support (chuck) 140 and an ionization source (coil segment) 116 that couples to the substrate support. Moslehi et al also teach that peripheral ionization source (coil) 116 includes individual inductive elements (coils) that are connected in series through capacitors (to balance mutual stray capacitance) since all the inductive elements of the coil are grounded (Moslehi et al - Figures 8A, 8B and Column 11, lines 1-10 and Usui- Figure 1).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a shield with slots as taught by Moslehi et al in the apparatus of Usai in view of Tanaka et al, Denda et al and Hanawa to minimize proper matching of grounding capacitance and coupling capacitors and RF potential on the antenna (column 11, lines 1-10).

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) and Pu et al (US Patent No. 6,042,686).

Regarding Claim 18: Usai in view of Tanaka et al teach all limitations of the claim (as explained above under claim 1) except that the peripheral ionization source having a segmented configuration of alternating high and low-radiation sections arranged in a ring and positioned to couple power into a plasma over the substrate support surface in an annular alternating high and low power distribution.

Pu et al teach an apparatus (Figure 8) that includes a matching network 31 that has an inductor 93 connected in series between input and output ends and the inductor 93 is connected in series with ionization source (coils 40, 42). Further, Pu et al teach (Figures 1-3, 9) an ionization source (coil) configuration that has alternating coil segments 40, 42 arranged in a ring positioned to couple power in an annular alternating low and high power distribution. Pu et al also teach that these coils can also be mounted inside the chamber. Pu et al also teach that it is possible for antenna/coil to have segments in various configurations/shapes (including parallel to dielectric chamber wall 10) as required for process limitations like shape and uniformity of magnetic field and shape and size of plasma chamber (Pu et al – Column 2, lines 45-50, Column 7, line 30 to Column 8, line 45 and Figure 9, Column 13, lines 10-25 and Column 16, lines 5-20).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coil with segmented configuration of alternating high and low radiation sections as taught by Pu et al in the apparatus of Usai in view of Tanaka et al to achieve enhance plasma density (Column 6, lines 20-30).

Claims 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui (US Patent No. 5,513,765) in view of Tanaka et al (US Patent No. 6,210,539) and Pu et al (US Patent No. 6,042,686) as applied to Claim 18 and further in view of Moslehi et al (US patent No. 6,471,830).

Regarding Claims 19, 20: Usai in view of Tanaka et al and Pu et al teach all limitations of the claim including that antenna/coil can have segments in various configurations/shapes (including parallel to dielectric chamber wall 10) as required for process limitations like shape and uniformity of magnetic field and shape and size of plasma chamber (Pu et al – Column 2, lines 45-50, Column 7, line 30 to Column 8, line 45 and Figure 9, Column 13, lines 10-25 and Column 16, lines 5-20).

Usai in view of Tanaka et al and Pu et al do not teach a shield having a segmented configuration of alternating high and low-transparency sections arranged in a ring and positioned to facilitate the coupling of there-through in the annular alternating high and low power distribution.

Moslehi et al teach an inductive plasma apparatus (Figures 4, 6) for a semiconductor wafer processing comprising an RF generator 126, a matching network 128, a substrate support (chuck) 140 and an ionization source (coil segment) 116 that couples to the substrate support. Moslehi et al also teach that the apparatus includes a metallic shield 152 (Faraday) with slots 500 (Figures 10A, 10B) and that shape and dimensions of shield and the slots can be optimized to match with the antenna configuration to minimize sputtering on the shield (Moslehi et al – Column 6, line 65 to column 10, line 8 and Column 12, lines 25-45 and Column 13, line 34 to Column 14, line 40 and Column 17, line 30 to Column 18, line 20).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a shield with slots as taught by Moslehi et al in the apparatus of Usai in view of Tanaka et al and Pu et al to protect the coil from process plasma and for plasma density enhancement (column 8, lines 10-50).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 1, 15-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3, 5, 8, 12, 13, 15 16 and 24 of copending Application No. 10/717, 268 in view of Usui (US Patent No. 5,513,765) and Tanaka et al (US Patent No. 6,210,539)

This is a provisional obviousness-type double patenting rejection.

Claims 3, 5, 8, 12, 13, 15, 16 and 24 of the copending application teach an ICP source for semiconductor wafer processing comprising:

An ICP source for a semiconductor wafer plasma processing apparatus comprising:

an RF generator;

a series RF circuit that includes a substrate support and a

peripheral ionization source connected to and surrounding the substrate support on the periphery of the substrate support, the substrate support and the

peripheral ionization source forming a common planar surface having a substrate support surface at its center;

a matching network coupling the RF generator into the series RF circuit; and the RF generator coupling RF energy to the series RF circuit to bias the substrate support surface to capacitively couple to a plasma proximate the planar surface and to

energize the peripheral ionization source to inductively couple to the plasma proximate the planar surface, thereby forming a high density plasma across the planar surface by both capacitively and inductively coupling energy thereto from the series RF circuit; and wherein .

the peripheral ionization source has a segmented configuration of alternating high and low-radiation sections arranged in a ring and positioned to couple power in an annular alternating high and low power distribution; and

the source includes a dielectric chamber wall and an antenna having a segmented configuration that includes a plurality of spatially concentrated conductor segments thereof parallel to the dielectric

chamber wall and perpendicular to the slots and aligned with the high-transparency sections of the shield, and a plurality of spatially distributed conductor segments aligned with the tow-transparency sections of the shield; and the high-radiation sections of the peripheral ionization source include the spatially

concentrated conductor segments and the low radiation sections of the peripheral ionization source including the low-transparency sections of the shield.

the high-transparency sections of the shield have a plurality of slots there through; and

the low-transparency sections of the shield are electrically conductive and generally solid relative to the high-transparency sections; and

the high-radiation sections of the peripheral ionization source include the spatially

concentrated conductor segments; and

the low radiation sections of the peripheral ionization source include the low-transparency sections of the shield.

Claims 3, 5, 8, 12, 13, 15, 16 and 24 of the co-pending application do not teach

a series RF circuit that includes substrate support and the peripheral ionization source connected to and surrounding the substrate support on the periphery of the substrate support, the substrate support and the peripheral ionization source forming a common planar surface having a substrate support surface at its center;

a matching network coupling the RF generator into the series RF circuit; and the RF generator coupling RF energy to the series RF circuit to bias the substrate support surface to capacitively couple to a plasma proximate the planar surface and to

energize the peripheral ionization source to inductively couple to the plasma proximate the planar surface, thereby forming a high density plasma across the planar surface by both capacitively and inductively coupling energy thereto from the series RF circuit.

Usai teaches a plasma apparatus (Figures 1-4) that comprises an RF generator 6,

a series RF circuit that includes a substrate support electrode 3 and an inductive plasma coil (peripheral ionization source) 2, {that is peripheral ionization source and the substrate support are connected together) a matching circuit 5 coupled to the series circuit such that both capacitive and inductive plasma are generated within the vacuum chamber. Usai also teach that the apparatus generates a stable high density plasma (Column 3, line 30 to Column 4, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a peripheral ionization source with substrate support connected in series as taught by Usai in the apparatus of Claims 3, 5, 8, 12, 13, 15, 16 and 24 to enable generate capacitive and inductive plasma simultaneously.

Claims 3, 5, 8, 12, 13, 15, 16 and 24 in view of Usai do not teach peripheral ionization source surrounding the substrate support and forming a common planar surface with substrate support at its center.

Tanaka et al teach a plasma apparatus (Figures 1, 3) that includes a plasma chamber 1 with pedestal 6 that has a substrate support portion 7 on which a substrate 8 is supported. Tanaka et al further teach that the apparatus further includes a coil (peripheral ionization source) 20 for generating plasma in the chamber that surrounds and is mounted on the periphery of the substrate support 6. Tanaka et al also teach that coil 20 is movable in up/down direction with the help of piston cylinder assembly 30 (to obtain optimum plasma field pattern) over a range from below the plane of substrate support to a plane above that of the substrate support 6 (that is, the peripheral ionization source surrounds the substrate support on the periphery of the substrate support, and the substrate support and the peripheral ionization source can form a common planar surface having a substrate support surface at its center (column 3, line 15 to column 4, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coil (peripheral ionization source) that surrounds the substrate support and forms a common planar surface with the substrate support (by up/down movement of coil) as taught by Tanaka et

al in the apparatus of Claims 3, 5, 8, 12, 13, 15, 16 and 24 in view of Usai by changing the location of the coil to provide uniform plasma potential and density parallel to surface of substrate (column 2, lines 20-40).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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